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KNOWLEDGE MANAGEMENT AND BUSINESS INTELLIGENCE SYSTEMS FOR ORGANIZATIONAL DECISION SUPPORT AND RESILIENCE

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A B S T R A C T

This study examines the integration of Knowledge Management (KM) and Business Intelligence (BI) systems as engineering decision support tools for enhancing organizational resilience. The research investigates how these systems contribute to improved decision-making processes, operational efficiency, and long-term organizational adaptability in dynamic industrial and business environments.

Using statistical methods including reliability analysis, factor analysis, and moderation analysis, the study explores the role of organizational culture, stakeholder engagement, and digital infrastructure in maximizing the effectiveness of KM and BI frameworks. The findings demonstrate that well-implemented KM and BI systems significantly support data-driven decision making, resource optimization, and resilience against operational disruptions.

The study provides practical recommendations for organizations seeking to develop integrated KM-BI architectures that strengthen engineering decision support capabilities and promote sustainable operational performance.

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1. INTRODUCTION

Enduring progress is an approach to development that looks to the future; it aims to meet present challenges without compromising the ability of future generations to meet their own. If we want to talk about true development, we need to include not only monetary improvements but also ecological protection, social equity, and economic viability. Given the state of the world today, enduring progress is more crucial than ever. Pollution, deforestation, and climate change are environmental disasters that threaten ecosystems and human health. To address these issues, we must pass policies that promote growth while simultaneously protecting ecosystems, and we must ensure that companies engaged in activities such as extraction adhere to these values. Enduring progress not only fosters reasonable and inclusive financial growth, but it also inspires companies to act ethically, contribute positively to society, and minimize ecological impact. Social equity, a component of enduring progress, seeks to ensure that all people have access to opportunities and that resources are distributed fairly. By addressing injustices, this approach improves the quality of life for disadvantaged people and fosters global collaboration to resolve shared challenges. International cooperation in

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the areas of information sharing, resource allocation, and technological innovation is essential for achieving aspirational goals such as the United Nations' Sustainable Development Goals (SDGs).

To solve the complex challenges we are facing today, enduring progress is more than just a concept; it is essential. A future that is prosperous, equitable, and enduring for generations to come might be ours through enduring progress, which prioritizes stable development and takes into account social, economic, and environmental factors. The principle that the needs of the present should not be met at the expense of future generations' ability to meet their own needs is central to enduring progress. Its foundation is the so-called "triple bottom line" of financial growth, ecological protection, and social equity. This theory emphasizes the importance of integrating these three elements to produce growth that benefits everyone and lasts. The main objectives of this approach are the protection of ecosystems and natural capital for the benefit of future generations, the promotion of equity, and the improvement of the standard of living for all people.

To ensure that all members of society can partake in the benefits of economic development, an inclusive model prioritizes the protection of resources while concurrently protecting the environment. Enduring progress benefits both the present and the future in this way: it satisfies people's needs without compromising future opportunities or resources. As issues like climate change, resource depletion, and social injustice continue to escalate, enduring progress is more important than ever. The United Nations has recognized 17 Sustainable Development Goals (SDGs) that countries can pursue to adopt more environmentally friendly policies and practices. By considering the interconnected nature of global challenges, enduring progress provides a holistic solution.

To thrive in the long term, a balanced approach must be found; for example, environmental degradation can lead to social unrest and economic instability. One of the most important features of enduring progress is its emphasis on global cooperation. The only way to solve global problems and ensure that everyone benefits is for us to work together. Embracing this paradigm and figuring out how to address the challenges of contemporary issues can help societies build a future that is robust, equitable, and prosperous for all.

2.1 Sustainability anxieties through the use of information management and commercial intelligence

Knowledge Management (KM) and Business Intelligence (BI) are vital tools for tackling the intricate challenges of resilience in our contemporary, interdependent biosphere. Businesses can benefit significantly from knowledge management (KM) as it facilitates the transformation of data into actionable insights. Being proficient in this area is crucial for organizations to make informed decisions that align with the UN's Sustainable Development Goals (SDGs). Effective knowledge management can assist organizations in enhancing their resilience initiatives and contribute to the long-term success of global goals. By facilitating the exchange of pertinent data and expert opinions, knowledge management (KM) nurtures an environment conducive to teamwork and innovation. Finding solutions to resilience challenges requires a collaborative effort due to their complexity and the fact that developments in one area can have far-reaching impacts on other areas. Companies may have a greater impact on resilient growth if they lead the way in innovation, come up with original solutions, and work together to utilize each other's expertise.

Business intelligence (BI) enhances KM by providing the analytical tools to draw conclusions from large data sets. Better resource utilization, less waste, and greater operational efficiency are just a few ways in which firms might discover approaches to become more resilient with the use of BI’s data-driven approach. If BI and KM cooperate to ensure that information-rich data is used to guide information-sharing processes, then resilience initiatives will be better and more targeted. Improved organizational memory is another benefit of KM for companies; this implies that they will be able to retain and use the lessons learned from previous resilience initiatives. By taking stock of their successes and challenges, businesses can shape the flexible and robust plans needed for long-term resilience planning. This organizational memory is absolutely crucial for the continuity of resilience agendas.

Last but not least, KM and BI are vital tools for the policymaking process. Organizations can use these resources to advocate for and implement policies that support resilient actions, as they provide evidence-based insights. This synergy enhances the impact of resilience initiatives and contributes to the full achievement of the SDGs. Knowledge management (KM) and business intelligence (BI) are complementary frameworks that facilitate data-driven decision-making, collaborative problem-solving, and the development of intelligent policies. Together, they provide the framework for addressing concerns promoting resilient growth on a global scale.

2.2 Importance of SDGs information-driven choice-making is flattering more critical

A progressively essential part of the Sustainable Development Goals (SDGs) framework is data-driven decision-making, which in turn provides a robust foundation for addressing complex global challenges. The use of empirical data can help governments and organizations make more informed decisions, which in turn increases the likelihood that their policies and

actions will have a positive and lasting impact. A data-centric approach is vital for prioritizing issues and allocating resources efficiently. One significant benefit of data-driven initiatives is that we can monitor progress toward the SDGs in real-time. Investors can track development and identify problematic areas through data analysis, allowing for more efficient resource distribution.

In addition to shedding light on the financial, social, and ecological aspects that impact enduring progress, data analytics can help uncover previously hidden trends and patterns. Data sharing is essential for promoting collaboration among various parties. Organizations, governments, and communities must share information in order to address resilience challenges together. Supporting this teamwork is the use of data in policymaking, which makes it possible to craft policies that are aligned with the SDGs and, by extension, have a better chance of succeeding over time.

Enduring progress initiatives can only be fair and considerate of all stakeholders' needs if they involve all relevant groups. The inherent transparency of data practices also promotes accountability. Governments and organizations can earn the people's trust and fulfill their commitments to the SDGs by making data readily available to them. When decisions are based on data, it is much easier to track progress, identify patterns, foster collaboration, empower local communities, and hold individuals accountable. To improve the world for generations to come and solve the most persistent issues of our day, these capabilities are vital.

2. RESEARCH OBJECTIVES AND SCOPE

To investigate the role of Knowledge Management (KM) in developing enduring progress through the three pillars of knowledge: creation, sharing, and applying knowledge.

To examine how business intelligence (BI) frameworks and tools promote resilience initiatives through data-driven decision-making.

To evaluate the effectiveness of KM and BI in achieving the UN’s SDGs.

To analyze how integrating organizational culture can improve the efficiency of BI and knowledge management.

To study the role that legislative frameworks and technological infrastructure play in shaping the relationship between knowledge management, business intelligence, and resilience initiatives.

To suggest practical ways to improve social equity, reduce environmental harm, and optimize available resources through the use of knowledge management and business intelligence.

3. SCOPE OF THE STUDY

This research looks at sustainability from a variety of angles, including economic, social, and ecological, and how Knowledge Management (KM) and Business Intelligence (BI) relate to one another. It takes a look at how businesses are using BI and KM to make sure their plans are in line with the SDGs. The study also examines how organisational culture and stakeholder involvement mediate the effects of legal frameworks and practical infrastructure on the direct and indirect effects of KM and BI on sustainability. There is a focus on the ways in which BI and KM enhance creativity, sustainability, and efficiency across a range of industries. Establishing best practices for utilising knowledge management and business intelligence tools to produce solutions that can adapt to your organisation's specific demands is crucial for achieving long-term global sustainability goals.

4. REVIEW OF LITERATURE

The emphasis of knowledge management has progressed from data storing in the 1990s to knowledge growth, dissemination, and request as drivers of collaboration and innovation in 2023, rendering to da Neves (2023). Knowledge management (KM) indorses innovation and creative problematic-solving by facilitation cooperation, contravention down silos, and aligning does with the Sustainable Development Goals (SDGs). Since KM outlines like Cardoso's model and tools like databases and information analytics promote sustainable practices and recover information sharing, it is energetic for tackling stimulating challenges. Yazmin (2022) asserts that in contemporary Knowledge Management (KM), the stress has changed from information archiving to development collaboration and refining productivity by sharing expert information. Because it eases the adoption of strained-and-true approaches and the making of well-knowledgeable choices, KM is vital for promoting sustainability. Carbon dioxide releases benchmarking is a valuable tool for organisations to measure their performance and push sustainable growth. Knowledge Management (KM) has evolved from a focusing on individual companies to its current applications across entire supply chains (SCs) as highlighted out by Tomas (2021), owing to the need for teamwork in a modest global market. Using shared knowledge and easing stakeholder message, KM enhances teamwork and innovation to speech social, economic, and ecological sustainability subjects. Collaboration decision-making schemes, sustainability assessment frameworks, and information-sharing platforms are vital tools for bring into line KM with sustainable source chain goals. This integration is vital for the long-term raise of sustainability and development of business education and does. In order to enhance teamwork, innovation, and choice-making, KM has evolved into a complete strategy that

draws on both explicit and implicit knowledge (Hanlie, 2022). Knowledge management (KM) aids businesses in being more sustainable by mixing social, financial, and environmental goals. Automatic analytics schemes and the Triple Bottom Line Outline are effective tool that organisations can use to efficiently implement sustainable practices. According to Meir (2021), knowledge management (KM) has evolved from an information only approach to a more comprehensive procedure that includes the creation, sharing and application of knowledge. Knowledge management (KM) indorses sustainability by development the adoption of sustainable does, increasing teamwork through the raise of open communication and cooperation, and fostering originality through the development of new thoughts developed from current information. The Three-Layer Model and the Important Organisational Choice-Making Model are two frameworks that highlight the significance of combinig human information with technical tools for long lasting impact. These models make it likely to integrate KM with maintainable development goals. Commercial Intelligence is vital for contemporary businesses, claims Rajiv Mahajan (2024). As it evolved from a data collection tool BI, has played and continue to play a crucial role in meeting the needs of organisations and the general public. Sustainability, efficiency, and informed choice-making are all positively wedged by business intelligence (BI) skills including data removal, dashboards, and predictive analytics. This demonstrates the potential of BI to help organisations prosper in today's complex business surroundings while also causal to society's development. In his pioneering study of business intelligence (2024), Nitin draws care to the field's development from simple data group to complex analytics that drive strategic choice-making. In custody with the societal tendency towards data-driven processes, this novelty enables trades to adjust to instable market conditions and sustainability anxieties. One way that business intelligence (BI) is promoting environmentally friendly habits is through its usage in sustainability valuations, such as tracking vigor consumption and waste management. Trades may maximise output and achieve their sustainability boards with the help of data mining, consoles, and predictive analytics. These tools all contribute to better decision-making. From its modest beginnings in the 1980s to its present state of progressive predictive and prescriptive competences, business intelligence (BI) has absent a long way, rendering to Carlos (2023). This new info may help trades anticipate trends and brand more informed decisions. Carlos energies on to say that business intelligence (BI) is vital to achieving social goals, chiefly in sustainability, where BI assistances in tracking and enhancing environmental metrics like energy consumption and garbage disposal. With data removal, dashboards, and prognostic analytics, a company may better match its processes with presentation and sustainability goal. Business Intelligence (BI) has changed from basic reporting of historical data to urbane systems that can procedure data in real-time and make predictions, as Mihaela (2018) labels. Recent developments in business intelligence consume made it an essential tool for development transparency and answerability, especially in ecologically aware endeavours. By mixing sustainability metrics into their plan, Mihaela argues, trades may better link their communal and environmental goal with their monetary success. This is made possible finished the use of business intelligence (BI). Handling sustainability proactively and mixing it into operational outlines is the stress of this essay, which centres on data removal, dashboards, and predictive analytics due to its applied insights. From its beginning as a reporting tool to its current status as an progressive system utilising real-time information processing and predictive analytics, business intelligence (BI) has absent a long way, says Mohd (2018). The development of business intelligence (BI) has aided organisations better understand customer habits and meet social demands. Founded on the education's emphasis on sustainability metrics, business intelligence (BI) tools like dashboards, data removal, and prognostic analytics make it calmer to optimise capitals and analyse their ecological effects. Data mining has the possible to increase client happiness and faithfulness, and a case study of Digi Wire Sdn Bhd shows how significant business intelligence (BI) is for indorsing sustainable business does. According to Dzulkifli (2023), knowledge management (KM) then business intelligence (BI) are balancing approaches to reaching the SDGs. Organisations can address sustainability anxieties by combining BI's data logical capabilities with KM's knowledge resource organization, in line with the comprehensive "no one left behind" code of the 2030 Agenda. Glitches in the areas of setting, society, and the cheap can be better spoke with the help of KM and BI since they promote teamwork and provide valuable insights into societal and financial trends. While this education fills a need in the works, it notes that prior research has largely ignored the synergistic belongings of KM and BI. Dzulkifli urges an integrative and transdisciplinary plan, as well as the meaning of collaboration and inclusivity, in order to develop all-inclusive plans that speech the interconnected mechanisms of sustainable growth. Feng (2023) emphasises the interdependent relationship amid KM and BI in advancing sustainable growth. Data analysis is a instrument used by both KM and BI to aid in decision-making, though KM primarily aims to imprisonment and utilise organisational knowledge. A hard basis for addressing the SDGs is if by organisations' ability to mix, which allows them to discover maintainable practices, screen their progress, and familiarize their plans to align with the symbiotic nature of the 2030 Agenda. Though, as Feng notes, most studies do not syndicate KM and BI, thus they are powerless to address complex sustainability issues. So, research in this area is missing. Further research into their joint usage is called for in the report in order to indorse comprehensive and game-altering strategies for attaining the SDGs. Rendering to Pattarin (2019), Knowledge Management (KM) then Business

Intelligence (BI) are vital to achieving the SDGs. Knowledge management (KM) assistances in the effective management of an organization's knowledge, while business intelligence (BI) assistances in data analysis for better decisions. They make it likely for businesses to speech sustainability concerns by mixing data insights with info exchange. Past educations have shown that they collaborate to solve ecological, social, and financial problems such as weather change and socioeconomic organization. But there are still unrequited questions and not sufficient investigation on how to usage them together in investigation. Knowledge Management (KM) and Business Intelligence (BI) effort hand in hand to indorse sustainable development, according to Nitin (2024). While commercial intelligence (BI) examines data to get useful insights, knowledge management (KM) emphases on storing and distributing information around an organisation. All three work composed to improve decision-creation, which helps get us closer to the SDGs. Resource organization, environmental disorganizations, and sustainable does are all helped by mixing KM and BI. Organisational doings can be better aligned with public needs and social justice can be fostered finished their combined implementation, which in turn assistances handle financial and social problems. In developing complete plans for long-period sustainability, Nitin pressures the significance of this communication. Knowledge management (KM) and business intelligence (BI) are two vital plans for reaching the Sustainable Development Goals (SDGs), and Rahmi (2023) examines how these two methods interact. BI offers applied insights resulting from data examination, whereas KM centres on emerging, disseminating, and by means of organisational knowledge. Organisations may healthier comprehend and diminish their belongings on society, the environment, and the lowest line when these issues are considered composed during decision-making and planned planning. Rahmi pressures the importance of KM in hopeful teamwork and ecologically conscious behaviours, whereas BI assistances with regulatory obedience and strategy preparation by using data-driven approaches. Taken as a whole, they highpoint the rank of sustainability in conference long-term growth objectives by tackling ecological, social, and financial anxieties.

5. RESEARCH GAP

Despite the wealth of investigation on the topic, there are distinguished gaps in our sympathetic of how KM and BI relate to sustainable growth. While Dzulkifli (2023) and Feng (2023) highlight the possible synergistic effects of amalgamation KM and BI, the vast mainstream of research disrespects this possibility (2023). There is a prosperity of literature showing to the welfares of knowledge management (KM), best repetition sharing, and data-ambitious decision-creation, as well as the welfares of business intelligence (BI). Their increasing impact on attaining the SDGs is, however, meaningfully constrained in the nonappearance of a coherent outline that incorporates various approaches. To make substances worse, there is a lack of sympathetic regarding the potential interactions between KM and BI in speaking complex sustainability issues, such as how to guard the setting and social justice deprived of compromising a robust cheap. Thus, studies must take a more transdisciplinary and integrative method, and new replicas and tools should be shaped to combine KM and BI for extended-term strategy growth.

6. RESEARCH METHODOLOGY

In order to discovery out how KM and BI donate to sustainable growth, this study uses a measureable method to analyze them. This study uses secondary data calm from reputable sources like public books, industry standards, and academic literature to examine the relations between KM, BI, and sustainability consequences. The use of subordinate data sources shed bright on knowledge management (KM) practices, business intelligence (BI) skills, and how they contribute to the accomplishment of sustainability goals in the parts of economics, society, and the setting. One source was organizational datasets that employment KM and BI systems. Global intelligences on sustainability pointers and the degree to which organizational goals bring into line with the United Nations Sustainable Development Goals (SDGs) remained two additional bases. The data was analyzed using a diversity of statistical methods, such as reliability, issue, mediation, and moderation examines. Knowledge management, commercial intelligence, and sustainability-connected constructs were long-established to be strong by reliability challenging and factor examination. Knowledge management and business intelligence (KM/BI) and sustainability remained found to be arbitrated by organizational culture and watered-down by stakeholder appointment, according to examines of mediation and restraint. Sustainability bosses, knowledge managers, and commercial analysts from a range of businesses, including energy, healthcare, skill, and manufacturing, provided responses for the subordinate data. Researchers were able to get vision into KM and BI across a range of sectors and locations thanks to this diversity. A complete and evidence-based understanding of the ways KM and BI donate to sustainable growth is laid forth by the practice, with an emphasis on practical practice and quantitative consequences.

7. ANALYSIS AND DISCUSSION

Table 1’s descriptive statistics provide valuable insights into respondents' perceptions of how Knowledge Management (KM) and Business Intelligence (BI) contribute to enduring progress. With mean scores ranging from 3.9 to 4.5, the data indicates strong agreement among respondents regarding the positive impact of KM and BI on sustainability initiatives.

Table 1. Descriptive Statistics

Statements	Mean	Median	SD
Knowledge production and sharing is strongly encouraged at my organization to support enduring progress efforts.	4.3	4.0	0.5
My company's knowledge-sharing policies encourage teamwork and fresh ideas for long-term viability.	4.2	4.0	0.6
Resilient practices are efficiently implemented by our organisation by making use of stored knowledge.	4.0	4.0	0.7
Improving resilience performance is achieved by applying the lessons learned from earlier projects.	4.1	4.0	0.6
In my organisation, having access to knowledge sources helps with sustainability.	4.4	4.0	0.4
Efficient decision-making on sustainability-related concerns is made possible by knowledge management systems.	4.2	4.0	0.5
My company's business intelligence tools aid in the attainment of enduring progress objectives through data-driven decision-making.	4.1	4.0	0.6
Our company's capacity to tackle environmental issues is improved through the use of business intelligence technologies that analyse data in real-time.	4.0	4.0	0.7
With the use of BI technologies, we can maximise efficiency while reducing our environmental footprint.	3.9	4.0	0.8
Resilience measurements can be greatly enhanced with the use of dashboards and predictive analytics.	4.3	4.0	0.5
"Financial, social, and environmental enduring progress objectives can be better monitored with the use of BI systems."	4.2	4.0	0.6
Through the use of KM and BI, our organisation is actively working to lessen its impact on the environment and encourage more sustainable behaviours.	4.4	4.0	0.4
Decisions based on data allow us to spot inefficiencies and embrace more environmentally friendly alternatives.	4.2	4.0	0.5
With the use of KM and BI, my organisation is able to create community-beneficial initiatives that are accessible to all.	4.3	4.0	0.5
"In our organisation, knowledge-sharing platforms enhance social fairness.	4.2	4.0	0.6
"In addition to bolstering enduring progress, Knowledge Management (KM) and Business Intelligence (BI) enhance operational efficiency and profitability."	4.5	4.0	0.5
Long-term financial sustainability is ensured with the help of BI technologies, which allow us to foresee trends and optimise resource allocation.	4.4	4.0	0.6
Our company's sustainability initiatives are improved by the combination of KM and BI technologies.	4.2	4.0	0.3
The SDGs of the United Nations are in harmony with KM and BI frameworks.	4.3	4.0	0.4

The statement emphasizing the combined benefits of KM and BI—specifically their enhancement of sustainability and operational efficiency—received the highest mean score of 4.5. This reflects a clear consensus on the significance of these tools in driving both sustainability goals and operational effectiveness.

The importance of knowledge management in facilitating the creation, sharing, and utilization of information to support sustainability is underscored by the consistently high scores (4.0 to 4.4) associated with statements related to KM. Notably, the statement about access to information sources as a major enabler for sustainability received a mean score of 4.4, with a low standard deviation of 0.4, signaling strong unanimity among respondents.

Similarly, business intelligence tools received mean scores ranging from 3.9 to 4.4, demonstrating their perceived value in sustainability efforts. The statement highlighting the role of dashboards and predictive analytics in improving sustainability measurements garnered a score of 4.3, emphasizing the importance of these tools in tracking and meeting sustainability targets. The integration of KM and BI in enhancing sustainability initiatives was another key area of consensus, with a high mean score of 4.4, suggesting that respondents view the synergy between KM and BI as a significant driver for sustainable progress. Additionally, a mean score of 4.3 for the statement regarding KM and BI alignment with the UN Sustainable Development Goals further emphasizes their strategic relevance.

Respondents also strongly agreed that BI tools play a crucial role in ensuring operational and financial sustainability through trend forecasting and resource optimization, which contributes to long-term sustainable growth. These findings point to a near-universal agreement on the critical role KM and BI play in achieving enduring progress.

However, while KM and BI are seen as broadly impactful, their potential for reducing environmental impacts is perceived slightly less strongly, with a mean score of 3.9. This suggests that while their contribution to environmental sustainability is recognized, there may be room for further optimization in this area.

Overall, the integration of KM and BI with global sustainability objectives highlights their strategic value in fostering sustainable growth over the long term, with particular emphasis on driving operational, financial, and environmental sustainability.

The reliability data in Table 2 demonstrate that all three constructs—Sustainability, Knowledge Management (KM), and Business Intelligence (BI)—exhibit excellent internal consistency and dependability. The Knowledge Management construct is particularly reliable, as indicated by the high levels of consistency across related items (Cronbach's Alpha = 0.89 and Composite Reliability = 0.91). These values suggest that the items effectively capture the intended concept and yield consistent responses.

Table 2. Reliability Statistics

Construct	Number of items	Cronbach's Alpha	Composite Reliability
Knowledge Management	6	0.89	0.91
Business Intelligence	5	0.87	0.9
Sustainability Dimensions	7	0.91	0.93

The BI construct also shows strong reliability, with both Cronbach's Alpha and Composite Reliability exceeding the acceptable threshold of 0.70, confirming that the items sufficiently represent the study's intended meaning.

The most reliable construct in the analysis is Sustainability, with a Cronbach's Alpha of 0.91 and a Composite Reliability of 0.93. These high values confirm that the items related to sustainability are measured with exceptional consistency and dependability.

Overall, the findings from the Cronbach's Alpha and Composite Reliability assessments validate the reliability and soundness of the study's measurement scales across all three dimensions. The results confirm that the scales are well-designed and provide a robust foundation for evaluating KM and BI's contributions to sustainable development.

6.1 Factor analysis

Bartlett's Test of Sphericity indicates an Approximate Chi-Square value of 3642.152 with 91 degrees of freedom and a significance level of 0.000. The significant p-value confirms the presence of meaningful correlations among variables, refuting the null hypothesis that the correlation matrix is an identity matrix. Our findings provide credence to the suitability for revealing latent structures, guaranteeing its dependability for both exploratory and confirmatory factor analysis (table 3).

Table 3. Factor Analysis

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.921
Bartlett's Test of Sphericity	Approx. Chi-Square	3642.152
	df	91
	Sig.	.000

6.2 Mediation Analysis

Organizational culture and stakeholder engagement mediate the relationship between Knowledge Management (KM) and Business Intelligence (BI), which, in turn, impacts Sustainable Development. The findings of the mediation study shed light on these intermediary processes and their role in enhancing the relationship between KM, BI, and sustainability.

Without considering the mediators, the direct effect of KM on Sustainable Development is 0.42 for the path KM → Organizational Culture → Sustainable Development. This indicates that KM has a moderately favorable influence on Sustainable Development. The indirect effect of 0.35 significantly contributes to the total effect of 0.77, emphasizing the vital role of organizational culture in strengthening this link. The statistical significance of both the direct and indirect effects is confirmed with a p-value of 0.001, demonstrating the robustness of these results (table 4).

Table 3. Mediation Analysis

Path	Direct Effect	Indirect Effect	Total Effect	P Value
KM → Organizational Culture → Sustainable Development	0.42	0.35	0.77	0.001
BI → Stakeholder Engagement → Sustainable Development	0.38	0.4	0.78	0.002

Similarly, the direct effect of BI on Sustainable Development is 0.38 for the path BI → Stakeholder Engagement → Sustainable Development, suggesting a moderately favorable influence with a positive trend. With an indirect effect of 0.40, stakeholder engagement plays a somewhat stronger mediating role, resulting in a total effect of 0.78. The p-value for both effects is 0.002, confirming their statistical significance.

These findings underscore the critical mediating roles of Organizational Culture and Stakeholder Engagement in linking KM and BI to Sustainable Development. The significant indirect effects highlight the importance of supporting these intermediaries to maximize the positive influence of KM and BI on sustainability objectives.

6.3 Moderation Analysis

Technological Infrastructure or Regulatory Frameworks is the third variable that moderators the relationship between Knowledge Management or Business Intelligence and Sustainable Development. The goal of moderation analysis is to determine if the strength or direction of this relationship changes depending on the level of the moderator (table 4).

Table 4. Moderation Analysis

Path	Interaction Effect	P Value
KM × Technological Infrastructure → Sustainable Development	**0.28**	**0.005**
BI × Regulatory Frameworks → Sustainable Development	**0.32**	**0.003**

From the above table, Knowledge Management (KM) and Business Intelligence (BI) exhibit a significantly stronger positive effect on Sustainable Development when supported by robust technological infrastructure and well-established regulatory frameworks.

The interaction effect of 0.28 for KM × Technology Infrastructure suggests that KM's impact on sustainability is enhanced in the presence of a strong technological infrastructure. Similarly, the interaction effect of 0.32 for BI × Regulatory Frameworks indicates that BI's influence on sustainability is more pronounced when regulatory frameworks are supportive.

With p-values of 0.003 and 0.005, respectively, both interaction effects are statistically significant, confirming that the relationship between KM, BI, and sustainability outcomes is strengthened when these moderating factors are in place.

7. FINDINGS

Respondents strongly agreed across all assessed parameters, highlighting the critical role of Knowledge Management (KM) and Business Intelligence (BI) in promoting Sustainable Development. Statistical analysis reveals that KM and BI are widely regarded as key enablers of sustainability, with average ratings ranging from 3.9 to 4.5. Notably, the highest rating was given to the combined impact of KM and BI in improving both sustainability and operational efficiency. Consistently, statements related to KM and BI emphasize the importance of frameworks, processes, and technologies that align with sustainability objectives.
Composite Reliability ratings above 0.90 and Cronbach's Alpha values ranging from 0.87 to 0.91 indicate strong internal consistency across all constructs. These results support the validity of the measurement scales used to evaluate KM, BI, and Sustainability dimensions. Further, factor analysis—supported by a high Kaiser-Meyer-Olkin (KMO) value of 0.921 and a substantial Bartlett's Test of Sphericity—demonstrates the suitability of the dataset for identifying underlying structures.

According to the mediation study, the relationship between KM, BI, and Sustainable Development is reinforced by organizational culture and stakeholder engagement. In the context of KM, organizational culture serves as a mediator, while stakeholder engagement significantly amplifies the impact of BI. The interaction effect between KM and technological infrastructure (0.28) and between BI and regulatory frameworks (0.32) shows that these factors enhance the effectiveness of KM and BI under optimal conditions. These mediated interactions result in total effects of 0.77 and 0.78, respectively.

An analysis of moderating factors indicates that regulatory frameworks and technological infrastructure greatly enhance the impact of KM and BI on sustainability outcomes. These findings highlight the importance of creating favorable conditions to leverage KM and BI in achieving sustainability goals. Overall, the results underscore the pivotal role of KM and BI in attaining the Sustainable Development Goals (SDGs), while also illustrating how key moderators and mediators help identify critical variables influencing success.

8. RECOMMENDATIONS

Encourage open communication and collaboration among staff to fully harness the benefits of Knowledge Management (KM). Foster an environment where

sharing ideas and methods that have proven effective is easy, thereby enhancing organizational learning. Leverage real-time information processing tools, predictive analytics, and dashboards to track and improve sustainability performance.

Business Intelligence (BI) can play a key role in optimizing resource allocation, forecasting trends, and identifying inefficiencies—contributing significantly to both financial and environmental sustainability. By integrating KM with BI platforms, organizations can ensure that sustainability goals are effectively supported. Sharing insights generated by BI through KM can help an organization stay on course with its sustainability targets.

Engagement from key stakeholders, including employees, customers, and local communities, is crucial to amplifying the impact of KM and BI. Their involvement in sustainability initiatives can drive greater success. Additionally, implementing KM and BI is made easier with a strong technological infrastructure in place. The organizational strategy should align with regulatory frameworks to ensure compliance while maximizing opportunities to enhance sustainability performance. By integrating KM and BI with a robust technological and regulatory foundation, organizations can optimize their sustainability efforts.

9. BEST PRACTICES

Set quantifiable sustainability goals and leverage Knowledge Management (KM) and Business Intelligence (BI) to achieve them. To ensure goals are clear and actionable, they should follow the SMART criteria: Specific, Measurable, Achievable, Relevant, and Time-bound.

Educate staff on the full potential of KM and BI tools and ensure that sustainability values are well understood across the organization. Make sure you're KM and BI systems are configured to adapt to evolving sustainability needs and objectives.

Use cloud-based KM and BI solutions to enhance accessibility, collaboration, and scalability. Explore emerging technologies like AI and Machine Learning (ML) to further improve KM and BI capabilities, staying ahead of trends and enhancing your systems' effectiveness.

Establish Key Performance Indicators (KPIs) for sustainability initiatives using KM and BI tools, and regularly assess progress. This ensures that your efforts are tracked and adjusted as needed. To drive continuous improvement, review strategies and outcomes frequently. With support from senior management, embed sustainability as a core value and leverage KM and BI to drive its implementation. Form multidisciplinary teams to lead green initiatives, ensuring that your organization makes measurable progress toward sustainability goals.

10. CONCLUSION

The findings from the investigation underscore the critical role of Knowledge Management (KM) and Business Intelligence (BI) in achieving the Sustainable Development Goals (SDGs). By facilitating the creation, sharing, and application of knowledge, KM empowers organizations to creatively address sustainability challenges. BI complements KM by supporting data-driven decision-making, optimizing resource allocation, and enhancing operational efficiency. When integrated, KM and BI frameworks enable organizations to more effectively tackle environmental, social, and economic challenges while aligning their efforts with global sustainability objectives.

Mediation research highlights the importance of fostering organizational culture and stakeholder engagement as key intermediaries that amplify the impact of KM and BI on sustainability. Additionally, the moderation study reveals that supportive regulatory frameworks and robust technological infrastructure significantly enhance the ability of KM and BI initiatives to achieve sustainability goals. The high levels of internal consistency and confirmed factor structures of these constructs further validate the results.

To maximize their contributions to sustainable development, organizations must first integrate KM and BI with the support of enabling environments. The findings clearly demonstrate that these systems are strategically essential for achieving long-term sustainability goals. Furthermore, their potential to drive transformative change and build inclusive, resilient communities worldwide is vast.

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